09-22-05 ↳ Chpt 2 test starts here

Measurement

☆ can only use a sci. [non-graphing] calc.

→ mass - grams (g)

→ length - meter (m)

→ volume - litre (L)
↳ l x w x h → cm^3

→ time - seconds (s)

g, m, s → fundamental units

$\frac{M}{D \mid V}$ → density - $\left(\frac{mass}{volume}\right)$

volume, density → derived units

→ all units apply to SI system

Base Units

larger ← gram → smaller

Tera (T)	Giga (G)	Mega (M)	Kilo (k)	hecto (h)	deca (da)	gram (g)	deci (d)	centi (c)	milli (m)	micro (μ)	nano (n)	pico (p)	femto (f)
1×10^{12}	1×10^{9}	1×10^{6}	1×10^{3}	1×10^{2}	1×10^{1}	1×10^{0}	1×10^{-1}	1×10^{-2}	1×10^{-3}	1×10^{-6}	1×10^{-9}	1×10^{-12} pg	1×10^{-15}
1×10^{-12} Tg →	1×10^{-9} Gg →	1×10^{-6} Mg →	0.001 kg →	0.01 hg →	0.1 dag →	1 g	← 10 dg	← 100 cg	← 1,000 mg	← 1×10^{6} μg	← 1×10^{9} ng	← 1×10^{12} pg	← 1×10^{15} fg

(micro: Greek letter "mew")

Most of time in class will be working w/ these units. (kilo through milli)

Factor Labeling / Unit conversions

J (joules) measures heat → E.

- 90 mL = ? daL so...

$$\frac{90\ mL}{1} \cdot \frac{1\ daL}{10{,}000\ mL} = \boxed{0.009\ daL}$$

- 7 kJ = ? cJ

$$\frac{7\ kJ}{1} \cdot \frac{100{,}000\ cJ}{1\ kJ} = \boxed{7\times10^{5}\ cJ}$$

$(10^5 \times 1)$

09-23-05

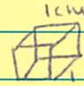
Metric → English conversions

- Length →
  - 2.54 cm = 1 in.
  - 1 m = 39.37 in.

Jessica Vaghela

- mass 1 kg = 2.2 lbs.
  454 g = 1 lb
- Volume →
  - 1 gallon = 3.78 L

→ for volume

1 mL = 1 cm^3 (1 cc) 

→ fill exactly one mL.

- Temperature
  - F ↔ C → $1.8\,C = F - 32$ (1.8 chiefs = Falcons - 32)
  - C ↔ K (kelvin) → $K = C + 273.15$

Example

$$21.7\ \frac{\text{miles}}{\text{hr.}} = ?\ \frac{m}{s}$$

$$21.7\ \frac{\text{miles}}{\text{hr}} \times \frac{5280\ \text{ft}}{1\ \text{mile}} \times \frac{12\ \text{in.}}{1\ \text{ft}} \times \frac{1\ (m)}{39.37\ \text{in}} \times \frac{1\ \text{hr}}{60\ \text{min}} \times \frac{1\ \text{min}}{60\ (\text{sec})} = \frac{1374912}{141732}$$

→ $9.7008\ \frac{m}{s}$

09-26-05

• Heat & Temperature → both deal w/ E.

Heat - measures the total KE in a sample. (size affects it). → measured in Joules (J).

Temperature - measures the average KE in a sample. → measure directly (ie w/ a thermometer)

*hot & cold → relative terms

• heat → * can not be measured directly.

- one of the ways one can measure heat → specific heat (C_p) - amount of E it takes to raise 1 g of substance 1°C.

$$C_{p H_2O} = 4.18 \frac{J}{g°C}.$$

09-28-05

Accuracy, Precision & Significant Numbers

- **accuracy** - how close one's observed value is to the actual value.
  - → relies a lot on equipment one is using. *
- **precision** (repeatability) - agreement among numeric values obtained.

- example → always seen → darts.

- **Significant Figures** → 4 steps.
  1) all non zero digits are significant. → ex < 12, 17 } both have 2 significant figures
  2) zeros between non zero digits are significant → ex < 101 → 3 sig. figs., 100001 → 6 sig. figs.
     → "a zero sandwich"
  3) a. zeros to the right of non-zero digits but left of an understood decimal place are **NOT** significant. → ex < 100 → 1 sig. fig., 1900 → 2 sig.

     b. If there is a decimal, all are significant. → ex < 100. → 3 sig. fig., 1900. → 4 sig. fig., 5.0 → 2 sig. fig.
  4) a. for #'s < 1, all zeros to the left of the first non zero digit are **NOT** significant.
     - ex.'s < 0.000124 → 3 sig. fig → in sci. notation → 1.24 x10⁻⁴, 0.0381 → 3 sig. fig.

     b. for # < 1, all zeros right of last non zero digit are significant.
     - exs < 0.001710 → 4 sig. fig., 0.100 → 3 sig. fig.

* round to least value of significant numbers.
- "no domino rounding".

09-30-05

• Proportions → direct vs. ~~indirect~~ inverse.

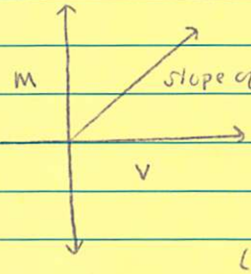
direct proportion – as x ↑, y ↑ proportionately (related by a constant) (K)

$x \propto y$ $x = Ky$

↑ is proportionate to

ex. $E = h\nu$

ex. $m = DV$ (usually seen as $D = \frac{m}{V}$) ←



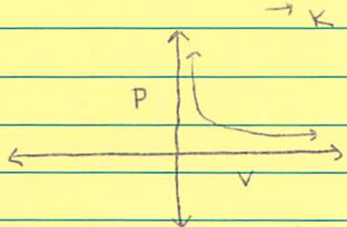
(applies for all direct proportions)

☆

• Inverse proportions – as x ↑, y ↓ proportionately. (related by a constant) (K)

→ seen with volume & pressure of gases. → V ↓, P ↑ ; $V = \frac{K}{P}$; $V = \frac{1}{P}K$

→ K → different for every temperature.



• Density → $D = \frac{M}{V}$

ex a rock has a mass of 60.0 gms. & a volume of 20.0 mL

→ what's the density?

→ $D = \frac{m}{V} = \frac{60.0\ g}{20.0\ mL} = 3.00\ g/mL$

(3 sig figs) (3 sig. figs)

☆ always go to the least # of sig. figs. ☆

manipulations of D. formula...

$m = DV$ & $V = \frac{m}{D}$

• Volume of a cylinder → $\pi r^2 h$

- ▭ or ☐ → lwh
- or w/ water displacement.